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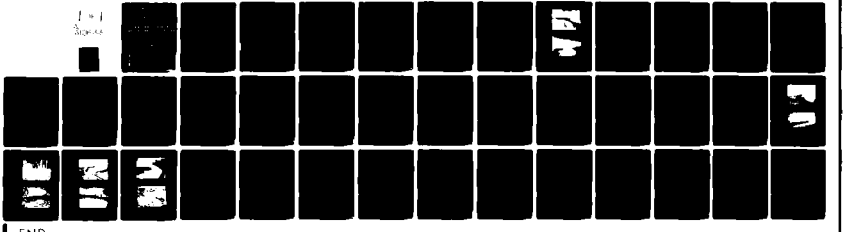

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JAMES RIVER BASIN

LEVEL II

Name Of Dam: CAMP HYDAWAY
Location: CAMPBELL COUNTY
Inventory Number: VA. 03113

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

PREPARED BY
NORFOLK DISTRICT CORPS OF ENGINEERS
803 FRONT STREET
NORFOLK, VIRGINIA 23510

IN CONJUNCTION WITH

COMMONWEALTH OF VIRGINIA
STATE WATER CONTROL BOARD

APRIL 1981

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

20. Abstract

Pursuant to Public Law 92-367, Phase I Inspection Reports are prepared under guidance contained in the recommended guidelines for safety inspection of dams, published by the Office of Chief of Engineers, Washington, D. C. 20314. The purpose of a Phase I Inspection is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general conditions of the dam is based upon available data and visual inspection. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

Based upon the field conditions at the time of the field inspection and all available engineering data, the Phase I report addresses the hydraulic, hydrologic, geologic, geotechnic, and structural aspects of the dam. The engineering techniques employed give a reasonably accurate assessment of the conditions of the dam. It should be realized that certain engineering aspects cannot be fully analyzed during a Phase I inspection. Assessment and remedial measures in the report include the requirements of additional indepth study when necessary.

Phase I reports include project information of the dam appurtenances, all existing engineering data, operational procedures, hydraulic/hydrologic data of the watershed, dam stability, visual inspection report and an assessment including required remedial measures.

JAMES RIVER BASIN

NAME OF DAM: CAMP HYDAWAY
LOCATION: CAMPBELL COUNTY, VIRGINIA
INVENTORY NUMBER: VA 03113

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

National Dam Safety Program. Camp Hydaway Dam (Inventory Number VA Ø3113), James River Basin, Campbell County, Virginia. Phase I Inspection Report.

PREPARED BY
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APRIL 1981

TABLE OF CONTENTS

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of the Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (flood discharges that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the design flood should not be interpreted as necessarily posing a highly inadequate condition. The design flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

BRIEF ASSESSMENT OF DAM

Name of Dam:	Camp Hydaway Dam
State:	Virginia
Location:	Campbell County
USGS Quad Sheet:	City Farm, Virginia
Stream:	Opossum Creek
Date of Inspection:	2 April 1981

Camp Hydaway Dam is an earthfill structure about 230 feet long and 19 feet high with a private roadway traversing the dam. The dam is owned and maintained by Mr. Daniel B. Candler. The dam is classified as small size with a significant hazard classification. The pipe spillway is a 10-inch cast iron metal pipe drop-inlet that connects to a 10-inch cast iron metal pipe which passes through the dam at low level and an open channel cut at the left abutment. The reservoir is used for recreation by the owner and the Lynchburg YMCA.

Based on criteria established by the Department of the Army, Office of the Chief of Engineers (OCE), the Spillway Design Flood (SDF) is the 100-year flood. The spillways will pass 7 percent of the PMF or 36 percent of the SDF without overtopping the crest of the dam. The effects of overtopping from the SDF are not considered detrimental to the embankment. The spillway is adjudged as inadequate, but not seriously inadequate.

The visual inspection revealed no problems in need of immediate attention. Maintenance is performed by the owner. However, there is no regular maintenance operations program or warning system. It is recommended that a regular maintenance and operations program be instituted with provisions for records of all maintenance performed. It is also recommended that a warning system be established and that the maintenance items listed in Section 7.2 be accomplished as part of the regular maintenance program within the next 12 months.

Submitted By:

Original signed by:
Carl S. Anderson, Jr.

CARL S. ANDERSON, JR., P.E.
Acting Chief, Design Branch

Approved:

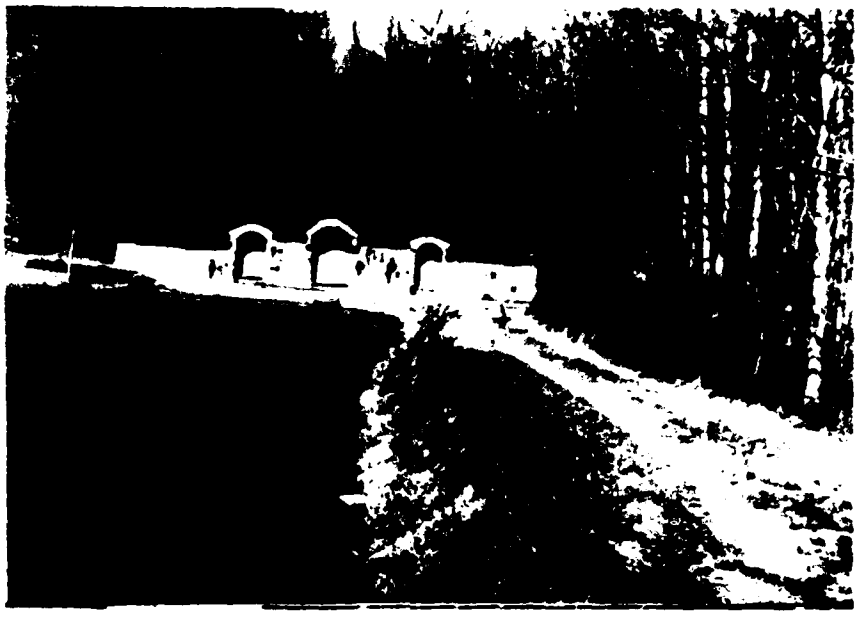
Original signed by
Douglas L. Haller

DOUGLAS L. HALLER
Colonel Corps of Engineers
Commander and District Engineer

Date: AUG 18 1981

Recommended By
Original signed by
JACK G. STARR

JACK G. STARR
Chief, Engineering Division



CREST

RESERVOIR AREA

OVERALL VIEWS - CAMP HYDAWAY DAM

2 APRIL 1981

SECTION 1

PROJECT INFORMATION

1.1 General:

1.1.1 Authority: Public Law 92-367, 8 August 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Safety Inspections of Dams throughout the United States. The Norfolk District has been assigned the responsibility of supervising the inspection of dams in the Commonwealth of Virginia.

1.1.2 Purpose of Inspection: The purpose is to conduct a Phase I inspection according to the Recommended Guidelines for Safety Inspection of Dams (Reference 1, Appendix IV). The main responsibility is to expeditiously identify those dams which may be a potential hazard to human life or property.

1.2 Project Description:

1.2.1 Dam and Appurtenances: Camp Hydaway Dam is an earthfill embankment about 230* feet long and 19** feet high. The crest of the dam is 12 feet wide and is traversed by a gravel private roadway. The dam crest is nearly uniformly horizontal at elevation 813.9 MSL. The upstream slope is 1 horizontal to 1 vertical (1H:1V) above the waterline and 2.9H:1V below the waterline. The downstream slope is 1.6H:1V. There is a bench extending along the downstream face just below the crest of the dam for nearly its entire length. The upstream slope is riprapped at normal pool level.

The spillway consists of a 10-inch cast iron pipe riser, (pipe spillway) elevation 809.75 feet MSL located 15 feet into the reservoir and an open channel cut in the left abutment. The 10-inch cast iron riser is connected to a 10-inch cast iron pipe which passes through the dam at a low level and discharges at the toe of dam. There is a 23-inch metal drum over the 10-inch riser acting as a trash guard. The trash guard is supported by three fingers which rest upon the pipe spillway crest. The open channel cut has a control section 38.8 feet wide with a minimum crest elevation of 810.0 feet MSL. A two-foot wide by 3-inch deep notch has been cut into the spillway control section with an elevation of 809.75 feet MSL.

1.2.2 Location: Camp Hydaway Dam is located one mile southeast of the City of Lynchburg, Virginia between Candler and Jack Mountains on Route 677.

*Dam length is measured from natural ground at the left abutment to natural ground at the right abutment. The width of the open channel cut in the left abutment is not considered part of the dam length.

**Dam height based on the difference in elevation between the streambed at the toe of the dam and the maximum height of the crest.

1.2.3 Size Classification: The dam is classified as a small size structure on the basis of its height as defined in Reference 1, Appendix IV.

1.2.4 Hazard Classification: There is a vacant mobile home site, an occupied home, and a State road and bridge in the area immediately downstream from the dam. A failure of the dam could endanger lives and cause economic losses. Therefore, a significant hazard classification is given to the structure according to guidelines contained in Section 2.1.2 of Reference 1, Appendix IV. The hazard has nothing to do with its stability or probability of failure.

1.2.5 Ownership: Camp Hydaway Dam is owned by Mr. Daniel B. Candler.

1.2.6 Purpose: The dam is used for recreation by the owner and the Lynchburg YMCA which operates a day camp at the site.

1.2.7 Design and Construction History: The dam was constructed during the years 1952 and 1953.

1.2.8 Normal Operational Procedures: Water passes automatically through the spillways as the reservoir rises above the spillway intake riser and the side channel crest.

1.3 Pertinent Data:

1.3.1 Drainage Area: The dam controls a drainage area of 1.9 square miles.

1.3.2 Discharge at Dam Site: Maximum Flood - unknown.

Pool level at crest of dam (elevation 813.9):

Spillway .....1000 cfs

1.3.3 Dam and Reservoir Data: Pertinent data on the dam and reservoir are shown in the following table:

TABLE 1.1 DAM AND RESERVOIR DATA

Item	Elevation feet msl	Area Acres	Reservoir Capacity		Length, feet
			Acre feet	Watershed, Inches	
Top of Dam	813.9	9.7	75	2.7	.25
Spillway Crest	809.75	7.3	53	1.9	.19
Stream Bed at Toe of Dam	794.9	---	---	---	---

SECTION 2

ENGINEERING DATA

2.1 Design: There is no design information available.

2.2 Construction: There are no known construction records. The dam was constructed by Gray Construction Company of Lynchburg, Virginia during the years 1952-1953. The owner indicated that the dam was well constructed in accordance with generally accepted practices for such projects.

2.3 Evaluation: There is no information available which would allow a sufficient foundation evaluation and an adequate embankment stability evaluation.

SECTION 3

VISUAL INSPECTION

3.1 Findings:

3.1.1. General: The results of the 2 April 1981 inspection are recorded in Appendix III. At the time of the inspection the weather was sunny and clear, with a temperature of 60°F and the ground conditions were dry. The reservoir pool elevation was 809.75 MSL. The tailwater was 795.9 MSL. There are no prior inspection reports.

3.1.2 Embankment: A sketch of the embankment showing a cross section and crest profile is provided in Appendix I. A plan view is also given in Appendix I.

The embankment crest and upstream face are in good condition. There are no signs of surface cracks, unusual movement, or misalignment. A good grass cover exists on the upstream face. Riprap was observed on the upstream face of the dam at the water level. The riprap appeared to have settled into the embankment. A gravel covered roadway, bordered by a satisfactory grass cover, traverses the crest of the dam. The downstream face is covered with underbrush and hardwood trees with diameters of up to one foot.

Clear standing water, approximately 10 feet wide, was observed 30 feet to the left of the pipe spillway outlet. The contact between the right abutment and the downstream face was damp with standing water at the toe approximately 10 feet across. These may be seeps but no noticeable flow was observed. There is an eroded or sloughed area on the downstream embankment face next to the right abutment. A bench extends along the downstream slope just below the crest level for approximately 200 feet. Additionally, there is an old eroded area of slough at the toe of dam to the left of the stilling basin.

3.1.3 Spillway: The spillway consists of a 10-inch cast iron pipe riser located in the reservoir (pipe spillway) and an open channel in the left abutment. A 23-inch diameter drum, supported by metal fingers atop the 10-inch riser, forms the trash guard. The riser is connected to a 10-inch cast iron pipe which passes through the embankment at a low level and discharges into a stilling basin at the toe of the dam. The outlet to this pipe was submerged and partially blocked by rock and debris. The open channel in the left abutment has a control section consisting of a masonry sill approximately 2 feet wide and 39 feet long. In the left side of the sill is a 2-foot section slightly lower than the rest of the sill. This 2-foot section is at the same elevation as the cast iron riser. The side channel has a masonry training wall on its left side directing flow beneath a concrete and steel bridge, crossing the channel approximately 20 feet below the control section. The bridge

is a concrete slab on steel beams with a minimum span of 14.8 feet and 3.8 feet clearance between the channel bed and the bottom of the bridge. Below the bridge the channel steepens abruptly and discharges into the natural channel below.

3.1.4 Instrumentation: There is no instrumentation on this dam.

3.1.5 Reservoir Area: The slopes of the watershed are mild to steep and covered with woods. There are no signs of reservoir slope failure. Sedimentation in the reservoir was not observed.

3.1.6 Downstream Channel: The channel immediately below the dam is a natural stream in a wooded valley. The streambed is clear of obstructions. Approximately one-half mile below the dam is one occupied structure and a highway bridge.

3.1.7 Stilling Basin: The stilling basin is shallow with riprap partially blocking the pipe spillway outlet.

3.2 Evaluation: Overall, the dam appears to be in good condition. The inspection revealed certain preventative maintenance items which should be scheduled as part of an annual maintenance program. These are:

a. Remove underbrush from dam. Cut all trees less than 3 inches in diameter at the ground. All trees greater than 3 inches in diameter should have their root ball removed and have compacted fill placed in the holes and the fill seeded. Seed bare areas, exposed by the clearing operations, to maintain a good grass cover over entire embankment.

b. Monitor wet area and standing water left of the pipe spillway and the wet area near the right abutment for increase in flow or for cloudiness of water. If either of these conditions develop, a geotechnical engineering firm should be consulted to evaluate the situation.

c. Underbrush in the eroded or sloughed area, noted in paragraph 3.1.2, should be removed and the area subsequent backfilled and seeded.

d. Remove any obstructions from the spillway outlet in the stilling basin.

e. Install gauge, which is a staff, rod, or post, with elevations indicated on it permanently mounted to show the depth of water. It should be of sufficient height to indicate depth of flow through the open channel cut spillway.

SECTION 4

OPERATIONAL PROCEDURES

4.1 Procedures: The normal storage pool elevation is about 809.75 feet MSL, which is the elevation of the crest of the 10-inch riser intake and the crest elevation of the 2-foot wide by 3-inch deep notch in the open channel cut spillway. Water passes automatically over the crest of the intake riser and the crest of the notch in the open channel cut spillway, as the water level in the reservoir rises. Water will pass over the entire open channel cut spillway crest when the lake level rises more than three inches above normal pool elevation since the 10-inch riser crest and the notch crest is only three inches below the crest of the open channel cut spillway.

4.2 Maintenance: General maintenance is performed at the dam by the owner as the need arises.

4.3 Warning System: At present time, there is no warning system or evacuation plan for Camp Hydaway Dam.

4.4 Evaluation: The dam does not require an elaborate operational and maintenance procedure. However, a program should be initiated to help detect and correct any problems that might occur. An annual maintenance program should be established which includes, but is not limited to, the constant monitoring of any wet areas as well as seasonal activities such as mowing and clearing.

An emergency operation and warning plan should be developed, to include:

a. How to operate the dam during an emergency.

b. Who to notify, including public officials, in case evacuation from the downstream area becomes necessary.

The local Emergency Services Coordinator of the State Office of Energy and Emergency Services can assist in the preparation of an Emergency Warning Plan.

SECTION 5

HYDRAULIC/HYDROLOGIC DATA

5.1 Design: None were available.

5.2 Hydrologic Record: None were available.

5.3 Flood Experience: The maximum flow at the dam site is not known.

5.4 Flood Potential: The 100-year flood, 1/2 PMF, and PMF were developed and routed through the reservoir by use of the HEC-1DB computer program (Reference 2, Appendix IV) and appropriate unit hydrograph, precipitation and storage-outflow data. Clark's Tc and R coefficient for the local drainage area was estimated from basin characteristics. The rainfall applied to the developed unit hydrographs was obtained from the U. S. Weather Bureau Publications (Reference 3 and 4 of Appendix IV).

5.5 Reservoir Regulation: Pertinent dam and reservoir data are shown in Table 1.1.

Water passes automatically over the spillways as the reservoir rises above the elevation 809.75 MSL.

The storage curve was developed based on areas obtained from a U. S. Geological Survey Quadrangle Map. Survey data taken during the inspection was correlated to the City Farm, Virginia Quadrangle Map to help develop area-storage data. Rating curves for the spillway and non-overflow sections were developed. In routing hydrographs through the reservoir, it was assumed that the initial pool level was at the elevation of the spillway crest elevation (809.75 MSL).

5.6 Overtopping Potential: The probable rise in the reservoir and other pertinent information on reservoir performance is shown in the following table:

Table 5.1 RESERVOIR PERFORMANCE

	Normal Flow	Hydrograph 100 Year 1/	1/2 PMF	PMF 2/
Peak flow c.f.s.				
Inflow	1.7	2737	7250	14500
Outflow	1.7	2727	7244	14493
Maximum elevation feet. MSL	810.0	815.2	817.2	819.6
Non-Overflow Section (Elevation 2855.0)				
Depth of Flow, feet	-	1.3	3.3	5.7
Duration, hours	-	2.0	5.3	9.3
Velocity, fps 3/	-	5.2	8.4	11.0
Tailwater Elevation Feet. MSL	795.9	---	---	---

1/ The 100-Year Flood has one chance in 100 of occurring in any given year.
2/ The PMF is an estimate of flood discharges that may be expected from the most severe combinations of critical meteorologic and hydrologic conditions that are reasonably possible in the region.
3/ Critical Velocity.

5.7 Reservoir Emptying Potential: No drawdown facilities were observed.

5.8 Evaluation: Based on the size (small) and hazard classification (significant), the recommended Spillway Design Flood is 100-year to 1/2 PMF. Based on the risk involved, the 100-year flood has been selected at the SDF. The spillway will pass 7 percent of the PMF or 36 percent of the SDF without overtopping the dam. Therefore, the spillway is adjudged as inadequate, but not seriously inadequate.

The spillway design flood will overtop the dam crest 1.29 feet for 2.0 hours and achieve an average critical velocity of 5.2 feet per second.

Conclusions pertain to present day conditions. The effects of future development on the hydrology has not been considered.

SECTION 6

DAM STABILITY

6.1 Foundation and Abutments: There is little information available on the foundation conditions, except what can be inferred from geologic studies of the area, which lies near the western limit of the Piedmont physiographic province. Briefly, the site is underlain by the Candler formation, which is charaterized by lustrous, gray-green phyllite and fine- to coarse-grained schist, according to Geology and Mineral Resources of the Lynchburg Quadrangle, Virginia, published by the Virginia Division of Mineral Resources. The geologic map in this publication indicates that the area beyond the right hand side of Opossum Creek is underlain by arch marble, but this material was not noted in outcrops at the damsite, and probably lies beyond the immediate area of the dam. Exposures of the Candler formation are seen in the open channel spillway and in ledges outcropping in the streambed below the dam.

The Soil Survey of Campbell County and City of Lynchburg, Virginia, published by the Soil Conservation Service, U. S. Department of Agriculture, indicates that the soils derived from and overlying the Candler formation in the vicinity of the dam consist variously of silt, fine sand, and clay, and mixtures of these. The predominate materials would be classified under the Unified System as SM, ML, MH, CH, AND CL. Using the pedological soil classification system is use on agricultural soil maps, these soils are identified as Manteo channery loam, Mason loam, and Tatum loam, soils typically derived from sericite schist. The Chewacla-Toccoa soil complex (alluvial material) is indicated along the streambed and banks. The underlying rock in the vicinity of the dam is indicated in the soils and geology publications to be at a relatively shallow depth, as little as eighteen inches and generally not more than five feet.

The site should afford a good foundation for the dam. In a sound, relatively unweathered and unfractured form, as the visible exposures suggest, the schist or phyllite bedrock here should offer a very good foundation, one which would be generally stable and impervious. The shallow depth to bedrock would facilitate the incorporation of an effective keyway or cutoff trench into the design of the dam, which was accomplished. The keyway trench was extended down to sound rock at a depth of approximately five feet below the base of the dam, and other portions of the embankment may well rest on rock also. The area soils are moderately permeable but seepage should not be excessive under portions of the dam not founded on rock, particularly with the construction of an adequate clay core and keyway trench. There is no foundation drainage system. The inspection did not reveal any deficiencies related to the foundation and abutments.

6.2 Embankment:

6.2.1 Materials: There is no information recorded on the exact nature of the embankment materials, but the source of borrow for the dam was located in the vicinity of the impoundment. As noted, the area soils appear

to be silts, fine sands, and clay, and mixtures of these. The dam owner indicated that the dam had been well constructed in accordance with generally accepted practices for such projects.

As discussed above the area soils probably used as fill for the embankment are fine grained residual soils of variable plasticity (low to high, probably of moderate plasticity on the average). The Nason loam and Tatum loam areas, generally on the slopes away from the immediate streambed and floodplain, afford the clayier materials, which would have been used presumably to construct the core of the dam. However, because the exact nature of the material used for the core, its dimensions, and the degree of differentiation between core and shell materials are all unknown, for the purpose of stability assessment, the dam will be classified as homogeneous.

6.2.2 Stability: There are no available stability calculations. The dam is 19 feet high and 12 feet wide at the crest. A gravel road traverses the crest of the dam. The upstream slope is 1H:1V down to elevation 809.9, where a bench approximately 10 feet wide begins. Beyond the bench the slope is 2.9H:1V. The downstream slope is 1.6:1V. The dam is not subjected to a sudden drawdown because there is no low level drain. The existing pool is slightly above maximum control storage pool, which is the pool that exists at the elevation of the crest of the spillway. In other words, there is presently about 3.9 feet of freeboard. The dam has routinely experienced the maximum control storage pool with no apparent ill effects.

According to the guidelines presented in Design of Small Dams, U. S. Department of the Interior, Bureau of Reclamation, the slopes recommended for a homogeneous small dam of similar material not subjected to a rapid drawdown are 3H:1V upstream and 2.5H:1V downstream. The recommended crest width is 14 feet. Based on these guidelines, the Camp Hydaway Dam has an inadequate downstream slope and crest width, and an adequate upstream slope, below the bench. The upstream slope above the bench is steeper than desirable.

6.2.3 Seismic Stability: The dam is located in Seismic Zone 2. Therefore, according to the Recommended Guidelines for Safety Inspection of Dams, the dam is considered to have no hazard from earthquakes provided static stability conditions are satisfactory and conventional safety margins exist.

6.3 Evaluation: There is insufficient information to adequately evaluate the stability of the dam. However, the visual inspection revealed no apparent instability, other than the sloughed area and the toe of the dam in the vicinity of the stilling basin located at the right abutment, which may have resulted largely or entirely from surface runoff. Based on the visual inspection, the foundation is considered sound. Based on the Bureau of Reclamation guidelines, the Camp Hydaway Dam has an inadequate downstream slope and crest width, an adequate upstream slope below the bench and an inadequate upstream slope above the bench. The undesirable effects from a stability standpoint of the less than recommended crest width, downstream slope, and upper upstream slope are somewhat offset by the bench on the

upstream face. As a consequence of this feature, the base of the dam is considerably broadened, which enhances the stability of the structure. The embankment is considered stable during both normal pool and maximum storage pool operations. In addition, overtopping is not a problem because during the spillway design flood (100 Year Flood), flows only slightly exceed one foot in depth (1.3 feet), are of relatively brief duration (2 hours), and have a velocity of less than 6 feet per second, the effective eroding velocity for a vegetated earth embankment. A stability check is not required.

SECTION 7

ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment: There is no engineering data to sufficiently evaluate the embankment stability. However, the visual inspection revealed no findings to prove the dam unsound. Based on criteria established by the Department of the Army, Office of the Chief of Engineers (OCE), the Spillway Design Flood (SDF) is the 100-Year Flood. The spillways will pass 7 percent of the PMF or 36 percent of the SDF without overtopping the crest of the dam. Flows overtopping the crest of the dam during the SDF are not considered detrimental to the dam. The combined quantity of the spillways is considered inadequate, but not seriously inadequate. Overall the dam is in good condition and there is no immediate need for remedial measures. A stability check of the dam is not required.

7.2 Recommended Remedial Measures: It is recommended that a regular maintenance operations program be formalized for future reference. A formal emergency procedure should be prepared and furnished to those responsible for maintaining the dam in a safe condition. This should include how to operate the dam during an emergency, and who to notify, including public officials, in case evacuation from the downstream area is necessary. The local Emergency Services Coordinator of the State Office of Energy and Emergency Services can assist in the preparation of an Emergency Warning Plan. Also, the inspection revealed the following maintenance items that should be scheduled by the owner during a regular maintenance period within the next 12 months:

a. All trees and saplings and underbrush on the downstream face of the dam should be cut even with the ground to prevent the eventual deterioration of the dam by root systems. All trees with diameters greater than three inches should have the root ball and root structure removed. The subsequent holes should be filled with well compacted soil and then seeded. Bare area exposed by removed underbrush should also be seeded to ensure adequate grass cover overall.

b. Monitor the wet area and standing water just beyond the toe of the dam to the left of the pipe spillway outlet and the wet area at the right abutment for increase in size or turbidity. If either condition develops, a geotechnical engineering firm should be consulted to evaluate the situation.

c. Sloughed or eroded areas on the downstream face left of the stilling basin and near the right abutment should be filled with compacted fill and seeded.

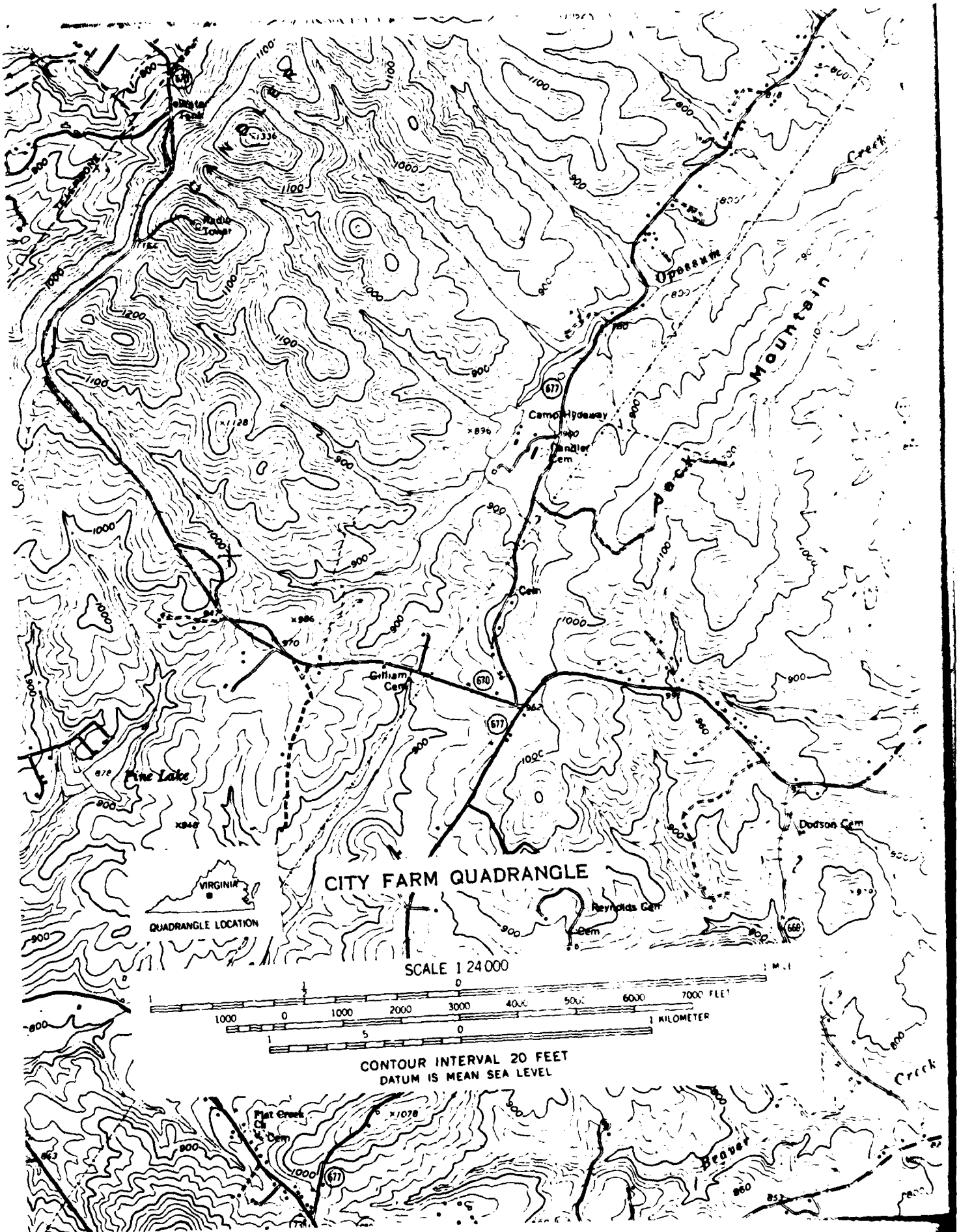
d. Remove the obstructions from the pipe spillway outlet in the stilling basin.

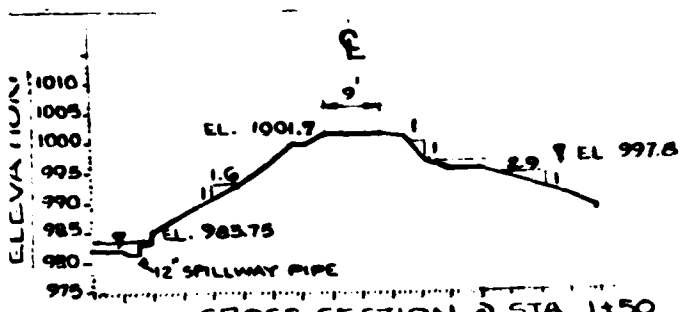
e. Install a staffgage, which is a staff, rod, or post with elevations on it permanently mounted to show the depth of the water. It should be of sufficient height to indicate the depth of flow through the open channel cut spillway.

f. Continue mowing the dam area to maintain the grass cover and prevent the encroachment of underbrush.

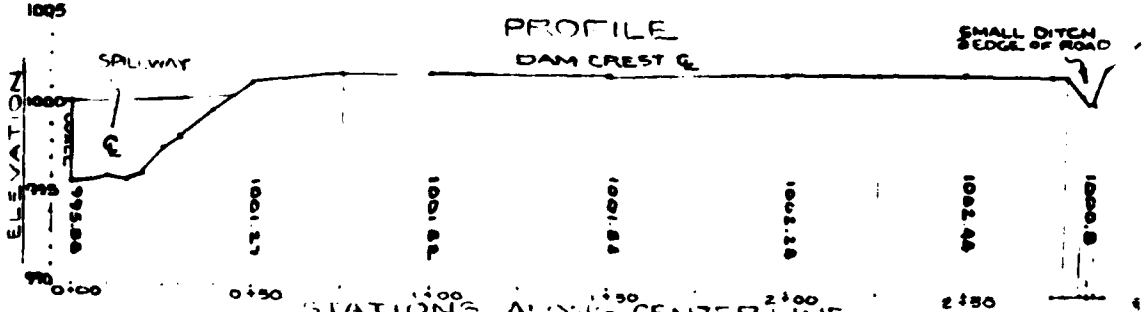
APPENDIX I

MAPS AND DRAWINGS

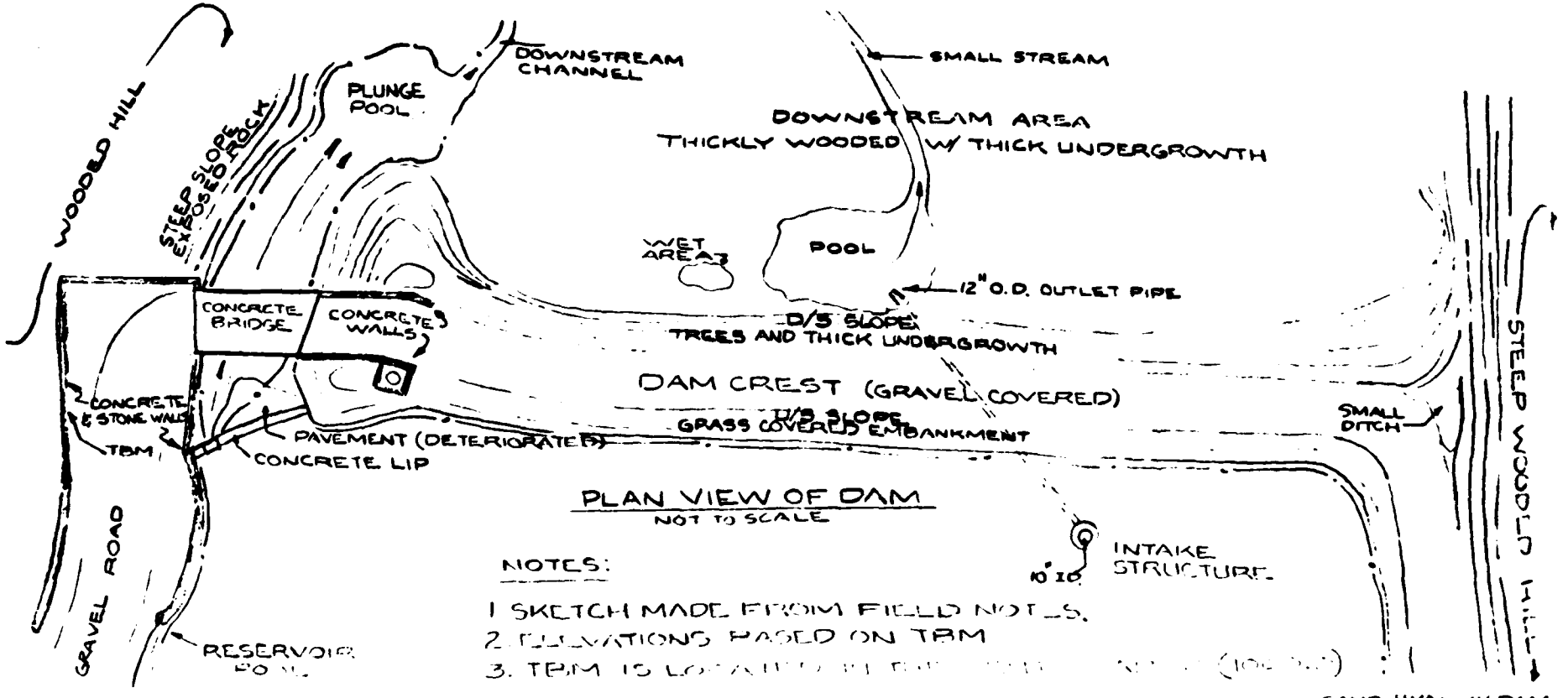

CITY FARM QUADRANGLE
VIRGINIA
QUADRANGLE LOCATION
SCALE 1 24 000
1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER
CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL
Pine Lake
Camp Hideaway
Gilliam Cem
Reynolds Cem
Dodson Cem
Flat Creek Ch
Cem
Beaver
Creek
Mountain
Creek
677
670
668



CROSS SECTION ℄ STA. 1+50
(TYPICAL)
SCALE: 1" = 30'



STATIONS ALONG CENTERLINE
℄ CREST
HORIZONTAL SCALE: 1" = 50'
VERTICAL SCALE: 1" = 20'



PLAN VIEW OF DAM
NOT TO SCALE

NOTES:

1 SKETCH MADE FROM FIELD NOTES.
2 ELEVATIONS BASED ON TBM
3. TBM IS LOCATED [illegible]

CAMP HYDEWAY DAM
3 APRIL 1981
PLATE

APPENDIX II

PHOTOGRAPHS

PHOTO #1 CREST OF DAM

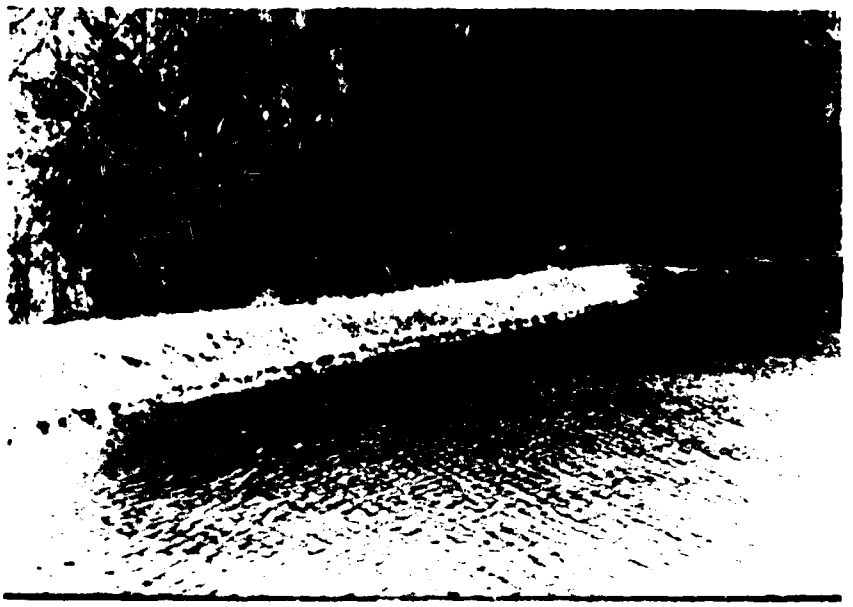


PHOTO #2 UPSTREAM FACE

PHOTO #3 DOWNSTREAM FACE

PHOTO #4 SEEP BEYOND D/S TOE OF DAM

PHOTO #5 SPILLWAY (ONE OF TWO)

PHOTO #6 SPILLWAY INTAKE STRUCTURE

PHOTO #7 SPILLWAY APPROACH CHANNEL

PHOTO #8 SPILLWAY DISCHARGE CHANNEL

APPENDIX III

FIELD OBSERVATIONS

Check List
Visual Inspection
Phase I

Name Dam: Camp Hydaway City: Campbell State: Virginia Coordinates: Lat. 37° .20.4'
Long. 79° 09'

Date of Inspection: 2 Apr 81 Weather: Clear Temperature: 60°

Pool Elevation at Time of Inspection: 809.756 MSL Tailwater at Time of Inspection: 795.9 MSL

Inspection Personnel:

Bo Taran, COE
Jim Robinson, COE
Matt Byrne, COE
Lenonard Jones, COE
Dave Bushman, SWCB
Leon Musselwhite, SWCB
Ed Constantine, SWCB
Mr. Daniel B. Candler, Owner

Dave Bushman, Recorders

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed.	None.
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	Possible old eroded area or slough at toe of dam to the left of the stilling basin and a wet area is located to the left of the stilling basin.	Clean away underbrush and fill with compacted fill, and reseed.
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Appeared to be a possible eroded or sloughed area on downstream face next to the right abutment. A bench extends along the downstream slope just below crest level for approximately 200 feet.	Clean away underbrush and fill slough with compacted fill and reseed. This may have been caused by runoff from the road ditch above it.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	No unusual movement observed. A gravel road traverses the crest from abutment to abutment.	None.
RIPRAP FAILURES	Rip-rap was placed on the upstream face of dam at water level, but had settled into the embankment.	None.

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
FOUNDATION	No foundation instability was observed.	None.
ANY NOTICEABLE SEEPAGE	Standing water approximately 10 feet across was observed 30 feet to the left of the pipe spillway outlet. The contact between the right abutment and the downstream face was damp with standing water at the toe approximately 10 feet across. These may be seeps but no noticeable flow was observed.	Monitor for increase in flow or for cloudiness of water. The standing water left of the stilling basin may be caused by the tailwater.
DRAINS	None observed.	None.
MATERIALS	Area soils are variously silt, fine sand, and clay, and combinations of these. There is material nearby that is sufficiently clayey to afford good quality fill for the core of the embankment.	None.
VEGETATION	Good grass cover on upstream face. Downstream face was covered with underbrush and hardwood trees with diameters up to one foot.	Cut all trees less than 3 inches in diameter at the ground. All trees greater than 3 inches in diameter should have their root ball removed and have compacted fill place in the holes and reseed. Remove underbrush.

PIPE SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONTROL SECTIONS	10-inch cast iron riser 23-inch metal drum acting as trash guard.	None.
APPROACH CHANNEL	None.	None
DISCHARGE CHANNEL	12-inch cast iron pipe submerged by tailwater and partially blocked. Stilling basin was large with flat side slopes. Below this there is a natural channel with little obstructions.	Remove obstructions from outlet pipe.
BRIDGE AND PIERS	None.	None.
EMERGENCY GATE	None.	None.
GATES AND OPERATION EQUIPMENT		

OPEN SIDE CHANNEL CUT SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONTROL SECTIONS	Masonry wier approximately 2 feet wide and 39 feet long located in left abutment. In left side of wier is a 2 foot section slightly lower than the rest of the wier at approximately the same crest elevation as the pipe spillway.	None.
APPROACH CHANNEL	None.	None.
DISCHARGE CHANNEL	Rock channel with masonry wall on left side directing flows beneath a concrete and steel bridge crossing channel approximately 20 feet below the control section. Below the bridge the channel steepens abruptly and discharges into the natural channel below.	None.
BRIDGE AND PIERS	Concrete slab on steel beams with a minimum span of 14.8 feet and 3.8 feet clearance between the channel bed and the bottom of the bridge.	None.

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATION
SLOPES	Steep and heavily wooded.	None.
SEDIMENTATION	Not measured.	None.

DOWNSTREAM CHANNEL

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.	Natural stream in wooded valley. Clear of obstructions	None.
SLOPES	Moderate slopes.	None.
APPROXIMATE NO. OF HOMES AND POPULATION	One occupied structure located approximately 1/2 mile below the dam. Site for mobil home approximately 1000 feet downstream 5-10 feet above stream bed currently unoccupied.	None.

INSTRUMENTATION

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None.	None.
OBSERVATION WELLS	None.	None.
WEIRS	None.	None.
PIEZOMETERS	None.	None.
STAFFGAGES	None.	Install staff gauge.
OTHER	None.	None.

APPENDIX IV

REFERENCES

REFERENCES

1. Recommended Guidelines for Safety Inspection of Dams, Office of the Chief of Engineers, Departments of the Army, Washington, D. C.

2. HEC-1DB Flood Hydrograph Package, (Hydrologic Engineering Center, U. S. Army Corps of Engineers, September 1978.

3. 'Probable Maximum Precipitation Estimates, United States East of the 105th Meridian," Hydrometeorological Report No. 51, (U. S. Weather Bureau, June 1978).

4. "Rainfall Frequency Atlas of the United States", Technical Paper No. 40, (U. S. Weather Bureau, May 1961).

5. "Design of Small Dams", Technical Publication of United States Department of the Interior, Bureau of Reclamation, Second Edition, Revised Reprint, 1977.

END

DATE
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